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MATCHING UNEMPLOYMENT AND VACANCIES IN REGIONAL LABOR MARKETS: AN EMPIRICAL ANALYSIS FOR THE NETHERLANDS

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ABSTRACT In this paper we analyze regional developments in unemployment and vacancies in the Netherlands during the 1980s. Our purpose is to establish to what extent the differences in unemployment and vacancy rates are due to differences in regional labor market performance. The analysis is carried out by considering labor market dynamics using the concept of the matching function. We find a constant returns to scale matching function with coefficients of 0.25 for unemployment and 0.75 for vacancies. Efficiency rises substantially during the recession in the beginning of the 1980s. Regional differences in efficiency appear to be small for most regions, suggesting that a reduction in regional unemployment should be achieved by stimulating regional labor demand.

1. INTRODUCTION

In the early 1980s, unemployment in the Netherlands increased sharply, only to decline after 1984. In contrast, the number of vacancies showed an opposite movement: a decrease in the early 1980s and an increase since 1984. By and large, these broad developments in unemployment and vacancies occurred in all regions of the Netherlands. Yet, there were substantial differences between regions with respect to the specific levels of unemployment and vacancies. For example, while in 1988 the average unemployment rate in Groningen was 22%, it amounted to only 11% in Zeeland and 12% in Utrecht.

There is a debate as to what extent a worsening of the functioning of the labor market contributed to the high unemployment in the Netherlands. Empirical studies based on the relationship between unemployment (U) and vacancies (V) claim that unemployment due to market imperfections has increased in the past decades. A general conclusion of Dutch U-V studies is that the U-V curve gradually shifted during the 1970s and 1980s (for an overview, see van Ours 1991). Explanations of this phenomenon differ and range from increasing heterogeneity due to structural changes in labor supply or labor demand, to decreasing search intensity of job seekers, increasing employers' selectivity, etc.

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Recent studies emphasize the importance of labor market flows in understanding the functioning of labor markets (Blanchard and Diamond 1989; Jackman et al. 1989; Blanchard and Diamond 1992). Instead of a traditional *U-V* curve (also called the Beveridge curve), these studies use a matching function to describe labor market performance. A matching function specifies the relationship between the flow of filled job vacancies and the stocks of job seekers and job vacancies. Only for a given flow of job vacancies is the matching function equivalent to an *U-V* curve. In the matching function approach, labor market efficiency is defined by the ratio of the probability that a contact between job seekers and employers results in a job and the rate at which they contact each other. Thus, both the duration of search for a new job by job seekers and the duration of search for a new employee by employers are important. Labor market efficiency is defined in terms of an average search duration.

In a study by van Ours (1991), a matching function was specified and estimated for the Dutch labor market. The study claimed that in the course of the 1970s and 1980s, the efficiency of the Dutch labor market remained quite stable. Van Ours concluded that even with a higher level of unemployment and a lower level of job vacancies, the Dutch labor market of today is apparently as efficient in generating a flow of filled vacancies as it was in the 1970s.

In this paper, we analyze developments in unemployment and vacancies for different regions in the Netherlands during the 1980s. It is important to pay attention to the spatial aspects of the matching process, because the geographical range of the relevant labor market for an economic actor is limited by, among others, the type of job wanted, educational level, income, cost of moving, time preference and travel costs. Hence, geographical space acts as a friction or barrier in the labor market, so that spatial adjustment processes (such as migration or commuting) are insufficient to ensure an efficient nationwide matching. This element is expected to have clear implications for the equilibrium and adjustment processes in the labor market. Therefore, the analysis of the functioning of a labor market should preferably be carried out at a spatially disaggregate level (see also Gorter 1991). It has already been mentioned that unemployment and vacancies are unevenly distributed among regions in the Netherlands.

The purpose of this study is to establish to what extent these differences in unemployment and vacancy rates are due to differences in regional labor market performance. Unfavorable labor market conditions (i.e., excess supply) in regions with relatively low efficiency levels can be improved by policies which aim to increase acceptance probabilities of job seekers and employers, or decrease the time needed to contact each other. However, if regional variations in labor market efficiency turn out to be insignificant (and if migration and commuting fail to act as equilibrating mechanisms), the most appropriate labor market policy is to create new jobs in the region.

We perform the empirical investigation by looking at the dynamics of the functioning of the labor market using the concept of a matching function. In this analysis we pool cross-section data for eleven regions (provinces) with time series information on the period 1980–1988 (provided by the Dutch Cen-

tral Bureau of Statistics). A similar analysis based on German data is carried out by Borsch-Supan (1991). Belderbos and Teulings (1988) used Dutch regional data for the years 1979, 1981, 1983 and 1985 (originating from the Dutch manpower surveys) to apply a matching function approach, but they did not focus on differences in regional labor market performance. Their reason for using panel data was to enlarge the number of degrees of freedom in the analysis. Another advantage of using panel data is that the cross-sectional variation in the explanatory variables (such as unemployment and vacancies) is expanded. Of course, we realize that the labor market areas used in our analysis (provinces) are discerned on administrative grounds and hence do not equal "closed" labor markets. On the other hand, most unemployed individuals in the Netherlands search for jobs locally in the area where they live, and this is usually inside the province.

This paper is organized as follows. In section 2, we discuss developments in the Dutch labor market during the 1980s, with specific attention to regional developments. In section 3, we discuss the use of a matching function to analyze differences in labor market performance. Section 4 presents the estimation results for the matching function. Section 5 concludes.

2. THE DUTCH LABOR MARKET IN REGIONAL PERSPECTIVE

Unemployed workers in the Netherlands have to register at the public employment office to be entitled to unemployment benefits. Monthly data on unemployment are available from this registration. The data on vacancies are from the vacancy surveys of the Central Bureau of Statistics (CBS). In these vacancy surveys, some 20,000 firms were questioned on whether they had vacancies at the date of the survey, and, if so, some questions were asked about the characteristics of the vacancies. The CBS vacancy surveys were held in October 1980, 1981, 1982 and 1983, September 1984, and January 1986, 1987 and 1988. The availability of the vacancy data restricts our analysis to these dates. We merged unemployment and vacancy data for these points in time in Figure 1, which shows the development of the unemployment and vacancy rates in the 1980s. As is obvious from this figure, the unemployment rate in the Netherlands went up substantially in the 1980s. In 1980, it was about 7%, while in 1984 it was about 18%. Since 1984, unemployment decreased somewhat. The vacancy rate decreased from 1.2% in 1980 to 0.5% in 1983, and increased again in later years.

In this paper, the focus is on the functioning of regional labor markets in the Netherlands. The demarcation of regional labor markets is far from easy, because regional interaction between supply and demand in the labor market may vary among groups as well as over time. In addition, regional labor markets can be defined from the viewpoint of job seekers or employers. The regional labor market for a job seeker is usually defined (see, for example, Fischer and Nijkamp 1987) as a region within which the employment opportunities open to a worker can be fulfilled without changing his or her place of residence (e.g., by daily travel from home to work). The geographical range of a regional labor market is affected by (among others) income, transport access and commuter time. Seen from an employer's perspective, the regional labor market may be defined as the regional area which contains the potential

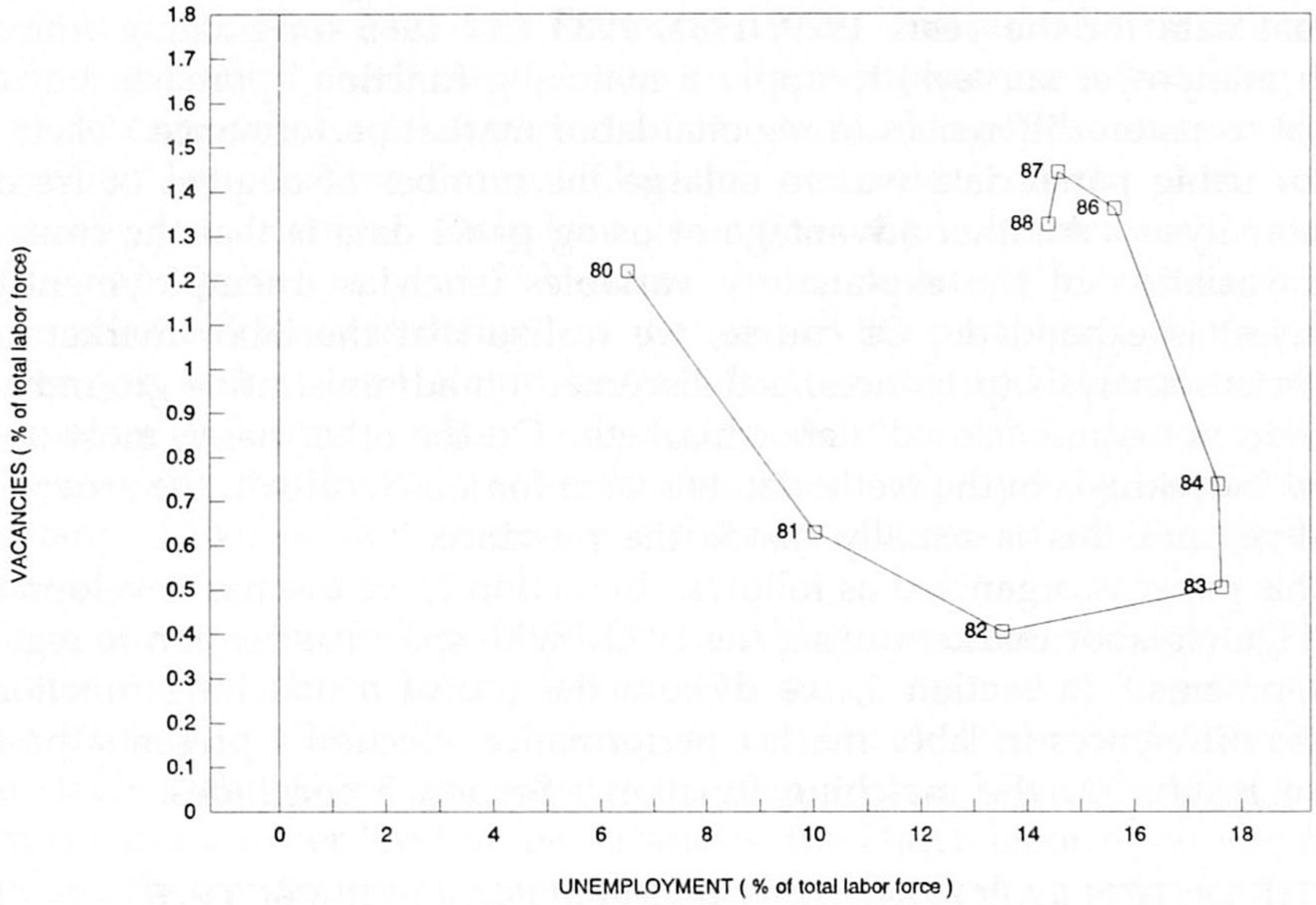

FIGURE 1. Unemployment and Vacancy Rates in the Netherlands 1980–88

pool of applicants a firm can — theoretically considered — attract (see also Fischer and Nijkamp 1987). Another important criterion in the delineation of labor markets — besides journey to work and the market's employment opportunities — is the accessibility to market information about job openings, actual and potential future wage, etc.

The demarcation of spatial labor markets that can be implemented in an empirical analysis is also strongly influenced by the availability of data. In this paper, we do not only need regional data on the stock of unemployment and vacancies, but also on the number of matches (i.e., the flow of filled vacancies). The lack of spatially disaggregated data on the flow of filled vacancies in particular forces us to define regional labor markets on the basis of administrative entities (provinces).

Table 1 presents some characteristics of the Dutch regions (provinces). First of all, the table shows that regions differ in their contribution to gross national product (GNP) and employment (E). The three provinces Utrecht, Noord-Holland and Zuid-Holland were responsible for almost half of the Dutch gross national product in 1984. Note also that the gross regional product (GRP) of Groningen is much higher than for Friesland and Drenthe (regions of comparable employment size), due to the natural gas found underground in this province. Population density also differs quite a lot between the regions. For example, the number of inhabitants per km^2 (INH/km^2) in Zuid-Holland is four to five times as high as in Friesland, Drenthe and Zeeland. With the exception of Zeeland, the share of people unemployed for more than twelve months (LONG) in 1988 does not differ that much between regions, while there are substantial differences in regional unemployment (U) and

TABLE 1. Regional Characteristics[a]

Variable	GRP	INH/ km^2	LONG	*U*-rate	*V*-rate	E x1000
Year	1984	1988	1988	1988	1988	1988
Groningen (gr)	8	237	55	21.6	0.7	136
Friesland (fr)	3	178	48	19.3	0.7	142
Drenthe (dr)	3	164	47	14.0	1.0	111
Overijssel (ov)	6	302	49	15.4	1.0	314
Gelderland (ge)	10	356	52	14.5	1.3	481
Utrecht (ut)	6	725	48	12.1	1.7	283
Noord-Holland (nh)	18	882	52	14.7	1.7	699
Zuid-Holland (zh)	24	1104	52	13.1	1.3	977
Zeeland (ze)	3	199	38	10.7	1.0	97
Noord-Brabant (nb)	13	436	48	13.7	1.3	613
Limburg (li)	6	505	52	15.1	1.3	313
Netherlands	100	434	51	14.4	1.3	4168

a. Source: Central Bureau of Statistics.

vacancy (*V*) rates (as a percentage of the labor force). The problem of unemployment appears to be most severe in the northern (peripheral) regions of the country. Moreover, it can be seen that the northern regions have low vacancy rates (0.7%), while the provinces Utrecht and Noord-Holland have high vacancy rates (1.7%).

A scatterplot for the data on regional unemployment and vacancy rates is presented in Figure 2. It shows the differences between regions for 1980 and 1988. In 1980 the spread in vacancy rates was larger than the spread in unemployment rates, while in 1988 this was the other way around.

When provinces are considered to be regional labor markets, it can of course be expected that employees living in one province will fill vacant jobs in other provinces (for example, by commuting). In order to find out to which extent such interprovincial matches occur in the Netherlands, in Figure 3 we show the number of individuals who find a job outside the province where they live, relative to the total number of individuals who find a job during a period of one year. This graph demonstrates that the percentage of interregional matches is in the range of 10 to 20%, which, in our opinion, is rather low. We also consider the level of interregional commuting of the employed by calculating the following two characteristics (for the years 1981, 1983 and 1985): (a) the percentage of jobs in a given province, occupied by workers living

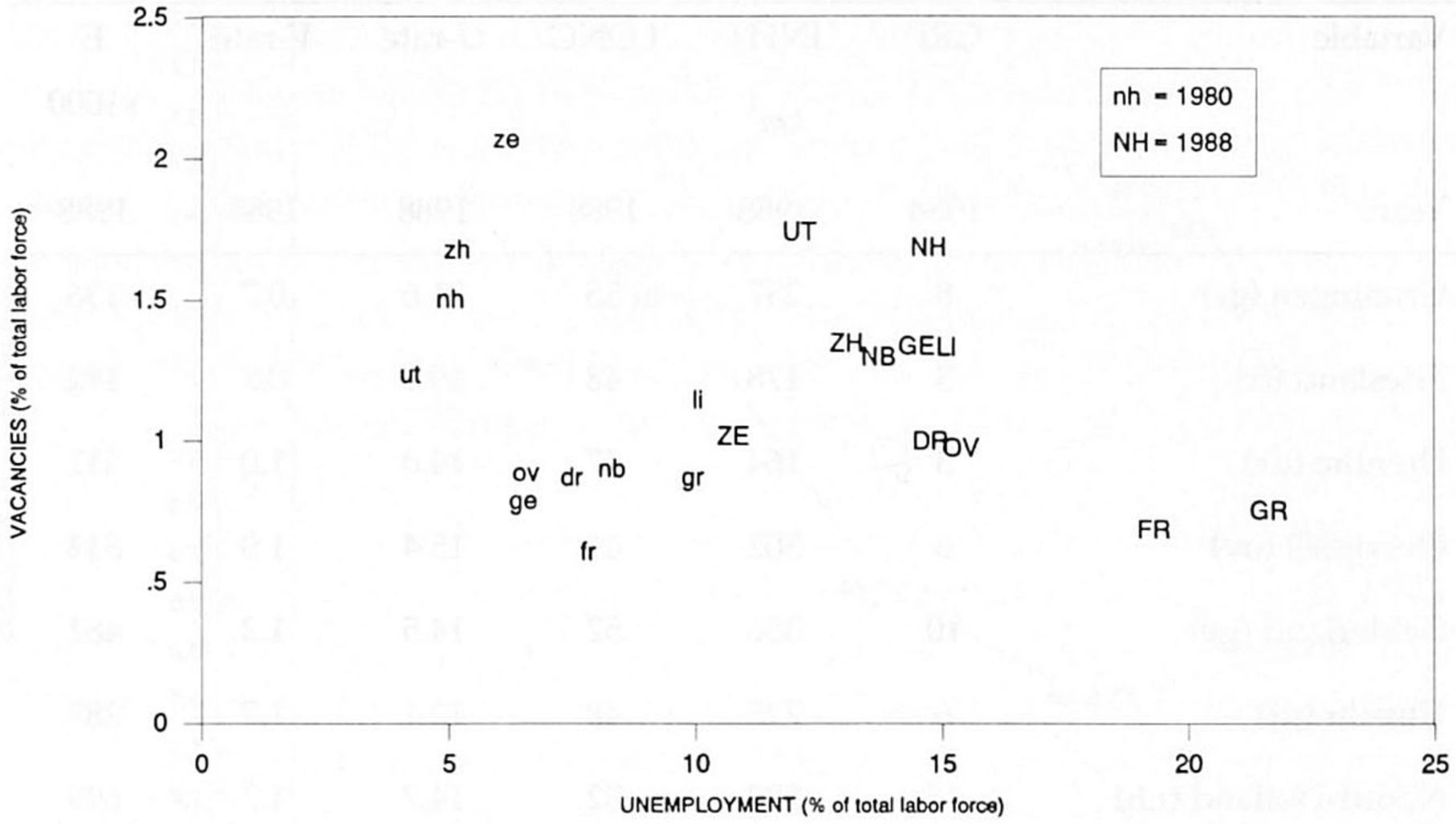

FIGURE 2. Regional Unemployment and Vacancy Rates 1980 and 1988

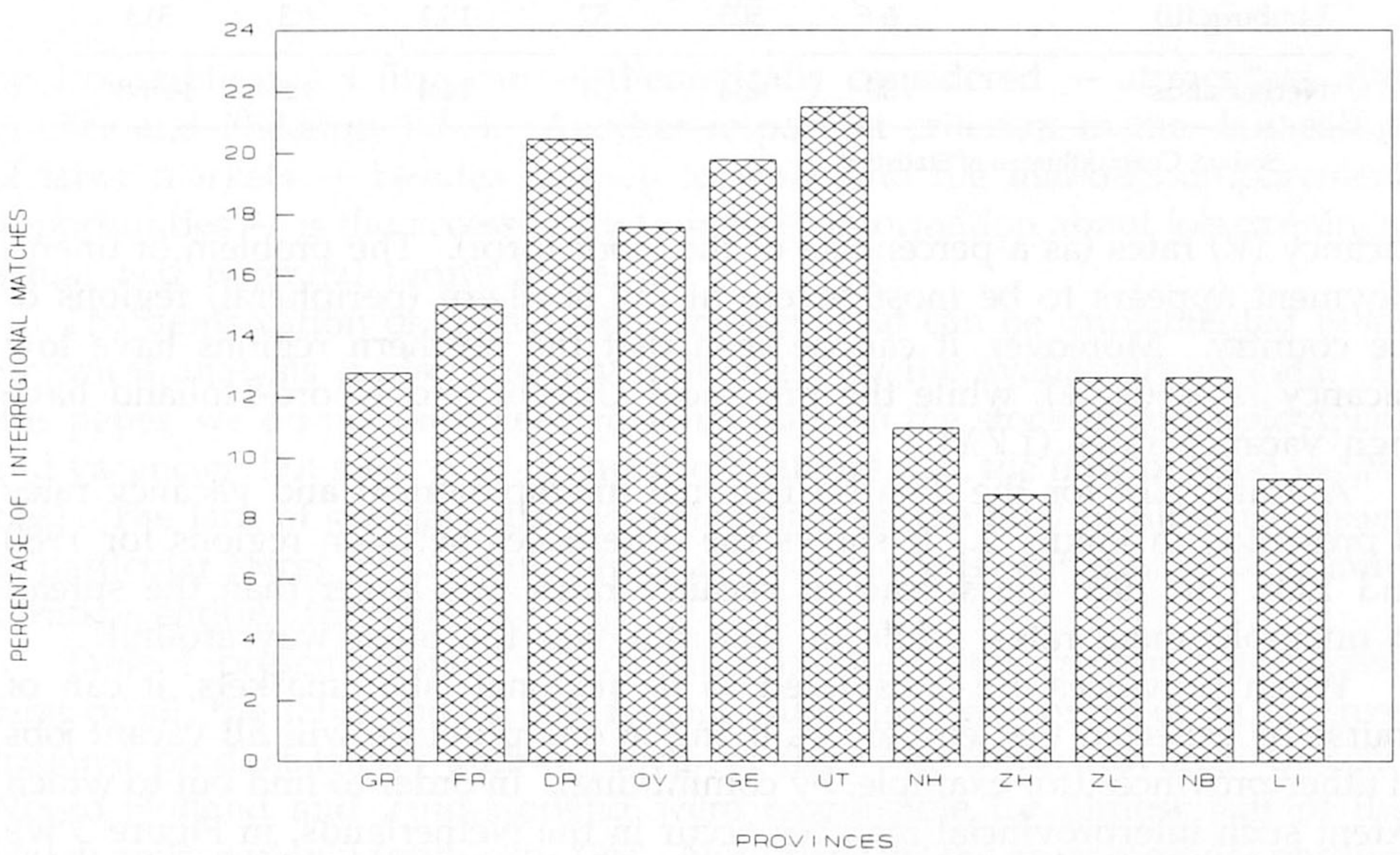

FIGURE 3. The Percentage of Interprovincial Matching in the Netherlands — 1981
(Source: Labor Force Survey)

in other provinces, shown in Figure 4; and (b) the percentage of workers living in a given province, who occupy job in other provinces, shown in Figure 5.

We realize that the outcomes presented in Figures 4 and 5 are based on stock data (i.e., regional employment) and not on flow data (i.e., matches

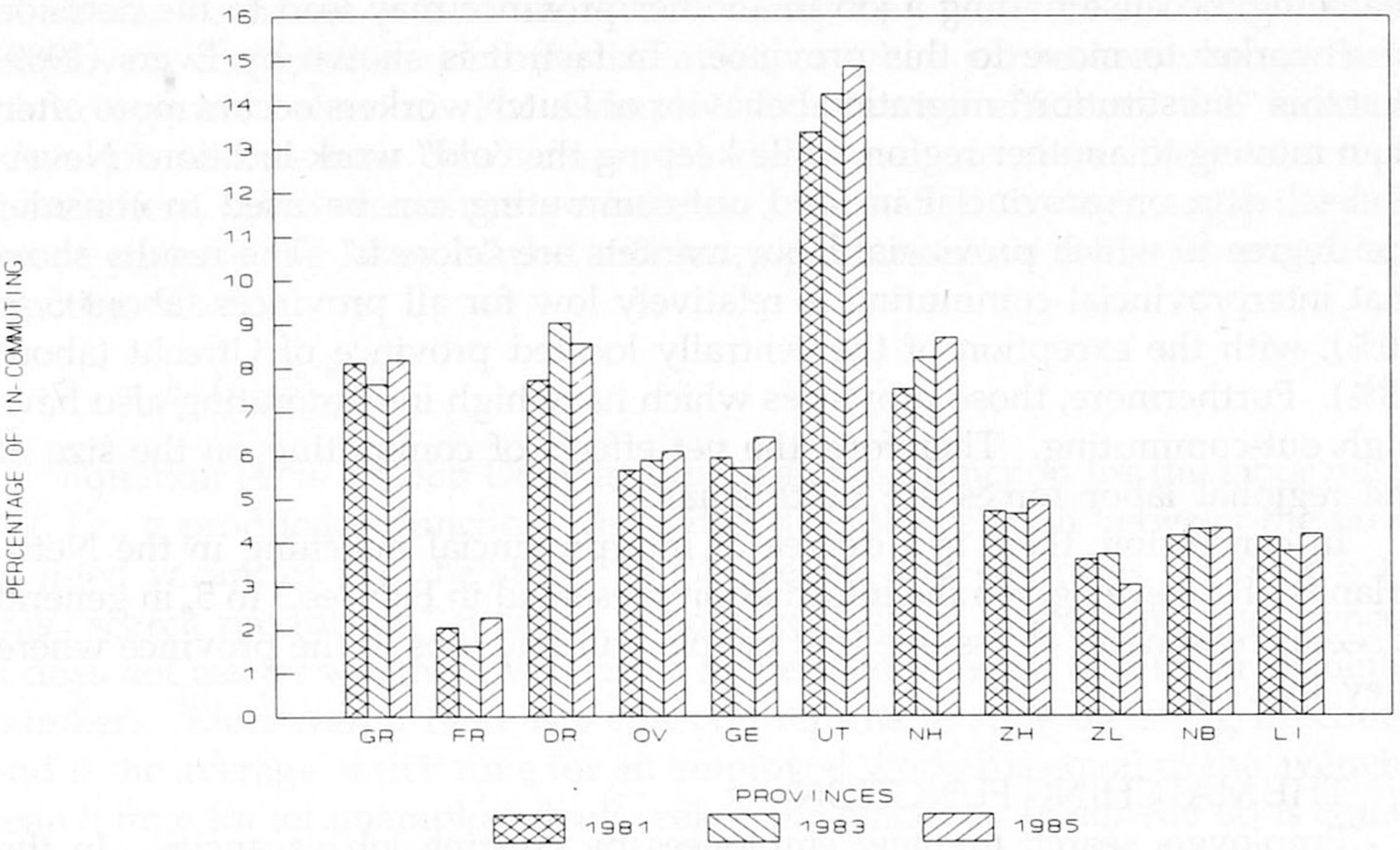

FIGURE 4. Percentage of Provincial In-Commuting in the Netherlands
(Source: Labor Force Survey)

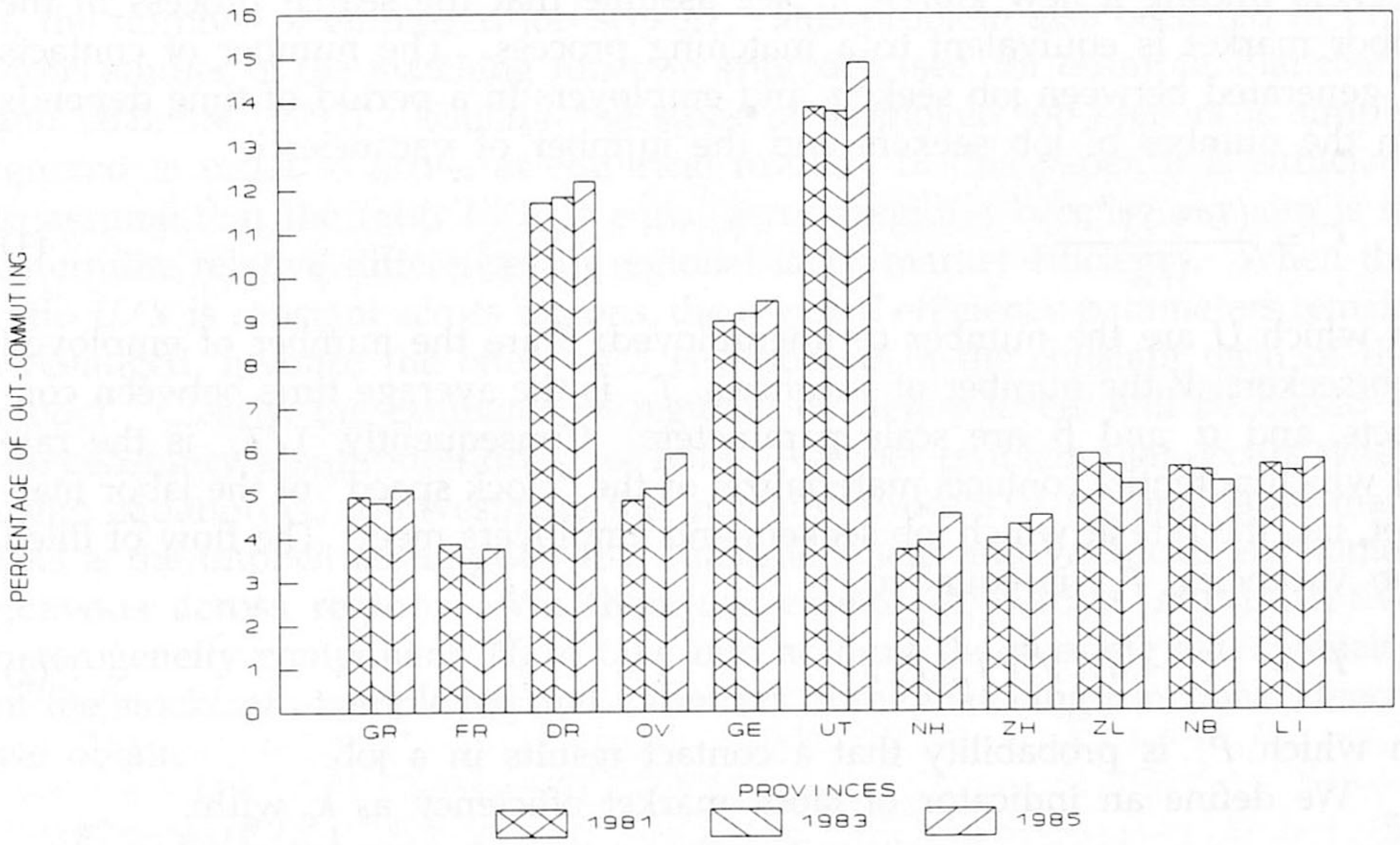

FIGURE 5. Percentage of Provincial Out-Commuting in the Netherlands
(Source: Labor Force Survey)

between job seekers and vacant jobs). In particular, the information on in-commuting is probably an underestimation of the degree of interregional matching, because finding a job in another province may lead to the decision of a worker to move to this province. In fact, it is shown by Evers (1989) that this "substitution" migration behavior of Dutch workers occurs more often than moving to another region while keeping the "old" work location. Nevertheless, data on provincial in- and out-commuting can be used to consider the degree to which provincial labor markets are "closed." The results show that interprovincial commuting is relatively low for all provinces (about 5 to 10%), with the exception of the centrally located province of Utrecht (about 13%). Furthermore, those provinces which have high in-commuting also have high out-commuting. Therefore, the net effects of commuting on the size of the regional labor forces are quite small.

In conclusion, there is a degree of interprovincial matching in the Netherlands. However, given the information presented in Figures 3 to 5, in general it seems reasonable to assume that people will find jobs in the province where they live.

3. THE MATCHING FUNCTION

Employers search for new employees by creating job vacancies. In the labor market, employers with vacancies and job seekers are searching for each other. This search process eventually leads to vacancies that are filled: employers hire a new employee, and unemployed find a job, or employed job seekers find a new job. The flow of filled job vacancies (F_v) is equal to the sum of the flow of unemployed finding jobs (F_u) and the flow of employed job seekers finding a new job (F_s). We assume that the search process in the labor market is equivalent to a matching process. The number of contacts C generated between job seekers and employers in a period of time depends on the number of job seekers and the number of vacancies:

$$C = \frac{(U+S)^{\alpha} V^{\beta}}{T_m}, \tag{1}$$

in which U are the number of unemployed; S are the number of employed job seekers, V the number of vacancies, T_m is the average time between contacts, and α and β are scale parameters. Consequently, $1/T_m$ is the rate at which potential contacts materialize, or the "clock speed" of the labor market, i.e., the rate at which job seekers and employers meet. The flow of filled job vacancies, F_v, is equal to:

$$F_v = [(U+S)^{\alpha} V^{\beta}/T_m] P_c, \tag{2}$$

in which P_c is probability that a contact results in a job.

We define an indicator of labor market efficiency as k, with:

$$k = P_c/T_m. \tag{3}$$

Labor market efficiency increases when the average time between contacts decreases, or when the probability of a contact resulting in a job increases. The latter probability is the product of two other probabilities: the probability

that an employer (conditional on the contact) offers a job to the job seeker, and the probability that a job seeker accepts this offer (conditional on the job offer). A change in labor market efficiency may therefore also occur when employers change their job offer behavior, or when job seekers change their job acceptance behavior. For example, labor market efficiency will increase when job seekers turn down fewer job offers and are more likely to accept these offers. However, since we have no information to disentangle the different parts of the labor market efficiency parameter we write the matching function as:

$$F_v = k(U+S)^{\alpha} V^{\beta}. \tag{4}$$

Equation (4) is a Cobb Douglas type matching function for the labor market, i.e., a production function which describes the relation between the flow of filled vacancies and the stocks of job seekers and vacancies. If $\alpha + \beta = 1$, this "search production" function is homogeneous of degree one, and, hence, it does not matter whether the relation is specified in terms of rates or absolute numbers. Moreover, if there is a constant returns to scale matching function, and if the average search time for an employed worker is equal to the average search time for an unemployed job seeker, the efficiency parameter (k) is equal to a geometric weighted average of unemployment and vacancy duration (for more details, see van Ours 1991). Pissarides (1990) argues that the matching function must have constant returns to scale in order to arrive at an unique equilibrium in the labor market. In our empirical application, we do not impose constant returns to scale, but test whether this restriction is allowed.

Unfortunately, we cannot estimate equation (4) since we have no data on S, the number of employed job seekers. This problem also occurred in previous studies of the matching function approach (see, for example, Blanchard and Diamond 1992). Usually, the stock of employed job seekers is simply ignored in order to arrive at empirical results. In this paper, it is sufficient to assume that the ratio U/S is equal across regions, because our aim is to determine relative differences in regional labor market efficiency. When the ratio U/S is constant across regions, the regional efficiency parameters remain unchanged, because the effect of S is absorbed in the constant term of the model. Clearly, the estimates of regional efficiency levels will be biased if the constancy assumption does not hold. Another problem that occurs when using equation (4) to investigate the matching process in regional labor markets is the implicit assumption that unemployment and vacancies are homogeneous across regions. We therefore extend (4) with a multiplicative heterogeneity component, H, to take into account the possible heterogeneity of the stocks of unemployed and vacancies in the matching function. Hence, we obtain

$$F_v^{rt} = k_{rt} H_{rt}^{\gamma} U_{rt}^{\alpha} V_{rt}^{\beta}, \tag{5}$$

in which the subscript r stands for the region, t for the year, and γ is a scale parameter.

By using (5), we can analyze whether or not the efficiency parameter k differs between regions and over time. We could also use traditional U-V

analysis to estimate regional differences in labor market efficiency (k_r), if the flow of job vacancies were constant over time. However, this condition appears to be not fulfilled (for more details, see Gorter and van Ours 1992). Therefore, we proceed with our investigation by applying the dynamic matching function approach.

4. ESTIMATION RESULTS FOR THE MATCHING FUNCTION

We estimated the loglinear form of equation (5), for which we used unemployment and vacancy rates and allowed the efficiency parameter k to vary over time and across regions. However, data on the flow of filled vacancies is not directly available for the Netherlands. Nevertheless, from the Dutch Central Bureau of Statistics vacancy survey, we have information on the number of vacancies, cross-classified by region (province) and by elapsed duration groups over the period 1980–88. Completed vacancy durations during this period were computed for each region by applying a nonparametric method for the estimation of average duration from data on the duration composition of the stock. Basically, we first used a Kaplan-Meier estimator to evaluate the survivor function $S(t)$ for filling vacancies (for t = 1, 3 and 6 months). The survivor function $S(t)$ is defined as the number of jobs that are vacant for more than t months, divided by the total number of vacant jobs in the stock. Second, average vacancy duration (T_v) was calculated by using the expression (see also Gorter 1991):

$$T_v = S(1) + S(3)\,2 + S(6) / [1 - S(6)/S(3)]\,3 . \tag{6}$$

If we assume that in- and outflow of vacancies are equal, the estimates for the annual flow of filled vacancies can easily be derived.

The heterogeneity of regional unemployment and vacancies is proxied by: (a) the percentage of long-term unemployed (defined as LONG); and (b) the degree of occupational mismatch between unemployment and vacancies. It is well known for the Dutch labor market that long term unemployed people have great difficulty in obtaining a job (see, e.g., Gorter 1991). Hence, we expect that LONG has a negative impact on the functioning of the regional labor market. The different composition of the unemployed pool and the stock of vacancies with respect to occupational groups may be another important determinant of the matching process. A natural measure for this mismatch of unemployment and vacancies is "the proportion to which unemployment is higher than it could be at given vacancies" (see Layard et al. 1991, p. 236). In that case, mismatch (MM_i) is evaluated by:

$$MM_i = 2\left[1 - \sum_i (U_i/U)^{1-\alpha} (V_i/V)^{\alpha}\right], \tag{7}$$

where the summation takes place over different homogeneous groups i.

In our analysis, we compute mismatch by using data on the occupational composition of unemployment and vacancies for each region (MM_o), and make the usual choice of setting α equal to 1/2 (see also Blanchard and Diamond 1989). We calculate regional mismatch (MM_r) for the Netherlands in a similar manner. The pattern followed over time by occupational and regional (pro-

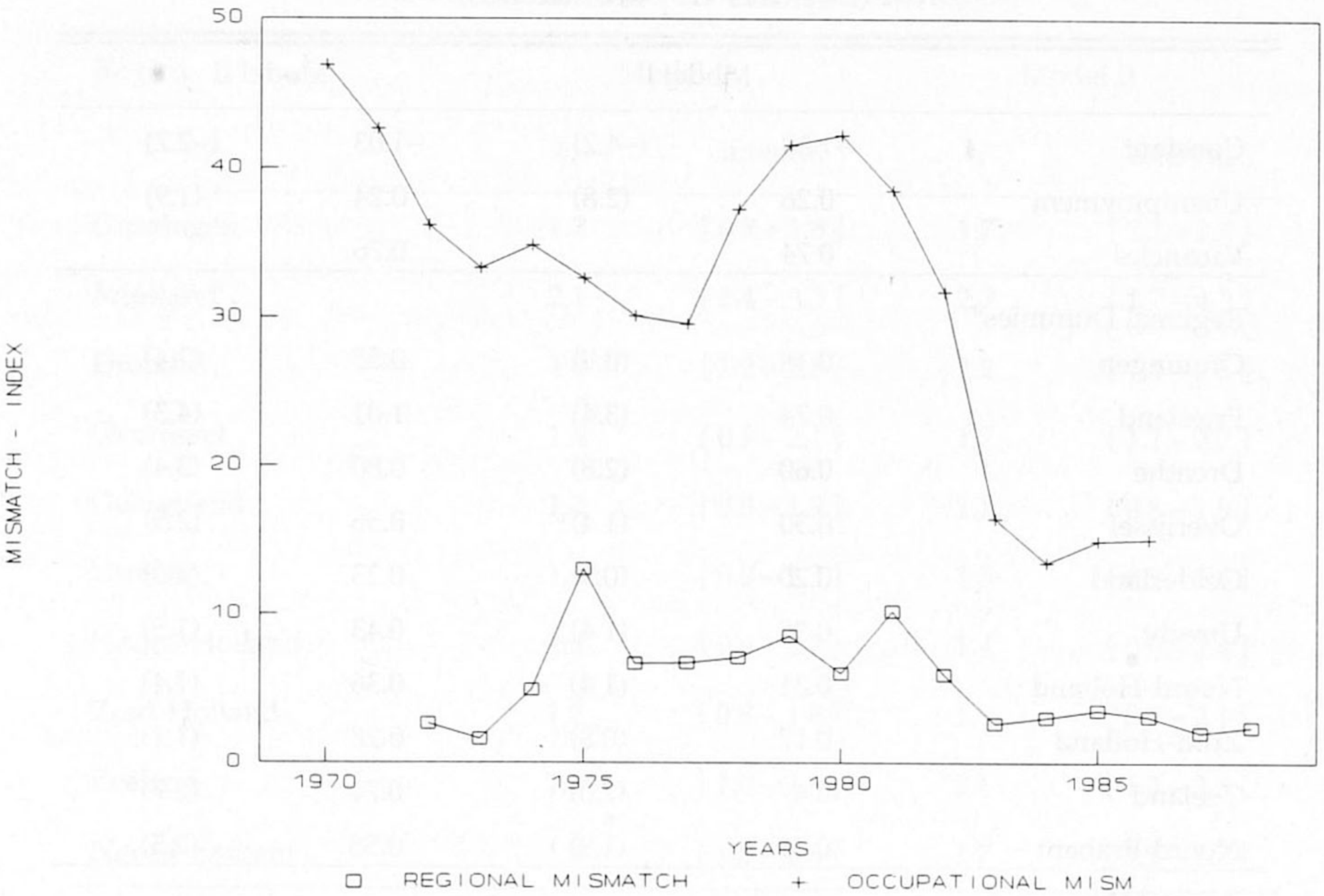

FIGURE 6. Occupational and Regional Mismatch in the Dutch Labor Market

vincial) mismatch for the Netherlands is shown in Figure 6, where mismatch is presented as a percentage of the maximum value of mismatch (equal to 200).

It appears that during the 1980s, regional mismatch was hardly present in the Dutch labor market. This implies that spatial adjustment mechanisms (commuting and migration) cannot lead to major improvements in the functioning of the national labor market (remember that it is assumed in our regional matching model that there is no interregional matching between unemployed job seekers and vacant jobs). This finding could be expected, because there is excess supply in all regions. The figure also shows that occupational mismatch decreased enormously during the period 1970–86. During the 1980s, mismatch reduced substantially in the first years, while it remained constant in later years. Unfortunately, we have no information on the occupational composition of (regional) unemployment and vacancies for the years 1987–88. Consequently, the heterogeneity variables LONG and MM_o could only be included both for the period 1980–86. Another possible heterogeneity variable would have been the degree to which each region is "closed" (see also section 2). However, the commuting variables are unknown for many years. In addition, they show hardly any variation over time (see also Evers 1989), so that including regional dummies as well as commuting variables would lead to problems with multicollinearity.

In sum, we estimated the matching function with LONG included as heterogeneity component for the period 1980–88 (model I), and with both LONG

TABLE 2. Estimation Results for the Matching Function
(*t*-values in parentheses)

	Model I		Model II	
Constant	–1.30	(–4.2)	–1.03	(–2.2)
Unemployment	0.26	(2.8)	0.24	(1.9)
Vacancies	0.74		0.76	
Regional Dummies[a]				
Groningen	0.18	(0.9)	0.55	(2.4)
Friesland	0.74	(3.4)	1.01	(4.3)
Drenthe	0.60	(2.8)	0.80	(3.4)
Overijssel	0.30	(1.4)	0.56	(2.5)
Gelderland	0.20	(0.9)	0.23	(1.0)
Utrecht	0.35	(1.4)	0.43	(1.5)
Noord-Holland	0.31	(1.4)	0.36	(1.4)
Zuid-Holland	0.17	(0.8)	0.28	(1.1)
Zeeland	0.47	(2.0)	0.74	(2.7)
Noord-Brabant	0.41	(1.9)	0.56	(2.5)
Annual Dummies				
1980	–0.49	(–1.3)	–0.48	(–1.2)
1981	–0.24	(–0.9)	–0.23	(–0.9)
LONG	0.25	(0.8)	0.25	(0.8)
MM_o			–0.13	(–1.0)
R^2 [b]	0.58		0.59	
ssr[c]	12.50		7.11	
n[d]	88		66	

a. The Province of Limburg is excluded.
b. Adjusted for degrees of freedom.
c. Sum of squared residuals.
d. Number of observations.

and mismatch (MM_o) for the period 1980–86 (model II). The results of the estimation are shown in Table 2.

The restriction of constant returns to scale could be imposed in both models. In other words, scale does not matter in the regional matching function. We also find equality of the time dummy variables for the period 1982–88 and 1982–86, respectively. Moreover, we observe that the parameters values for vacancies (unemployment), LONG and the annual dummies are quite robust against different specifications of the model.

The results show that the matching relation is not constant over time during the period 1980–82. According to this finding the functioning of the Dutch labor market has improved during this period and remained constant afterwards. In other words, the product of the rate at which unemployed job

TABLE 3. Regional Labor Market Efficiency (k)
(95% confidence interval in parentheses)

Region	Model I		Model II	
	k_r	interval	k_r	interval
Groningen	1.2	[0.8 – 1.8]	1.7	[1.1 – 2.7]
Friesland	2.1	[1.4 – 3.3]	2.7	[1.7 – 4.3]
Drenthe	1.8	[1.2 – 2.8]	2.2	[1.4 – 3.5]
Overijssel	1.4	[0.9 – 2.1]	1.7	[1.1 – 2.7]
Gelderland	1.2	[0.8 – 1.9]	1.2	[0.8 – 1.9]
Utrecht	1.4	[0.9 – 2.3]	1.5	[0.9 – 2.6]
Noord-Holland	1.4	[0.9 – 2.2]	1.4	[0.9 – 2.4]
Zuid-Holland	1.2	[0.8 – 1.8]	1.3	[0.8 – 2.1]
Zeeland	1.6	[1.0 – 2.6]	2.1	[1.2 – 3.5]
Noord-Brabant	1.5	[1.0 – 2.6]	1.7	[1.1 – 2.7]

seekers and employers meet and the probability that a contact results in a match must have increased in the beginning of the 1980s. At first sight, this seems surprising in the light of the huge rise of unemployment that occurred in this period. However, the rise in labor market efficiency might in fact have been caused by the rapidly increasing number of unemployed job seekers. This may have induced unemployed workers to increase search intensity, or to change their job acceptance behavior. For example, if workers became less choosy, and reduced their reservation wage (i.e., the minimum wage level for which one is willing to work), labor market efficiency may have improved.

The coefficient on vacancies (β) turns out to be about 0.75. If we also assume equal search periods for unemployed and employed job seekers, regional efficiency is the weighted average of regional unemployment duration and vacancy duration. Under this assumption, our finding means that regional efficiency depends relatively more on vacancy duration than on unemployment duration. The outcome of $\beta = 0.75$ is nicely in line with the estimate of 0.65 for the Dutch labor market as a whole, based on the period 1971–87 (see van Ours 1991). Belderbos and Teulings (1988) also found a constant returns to scale regional matching function (with $\beta = 0.64$) for the Netherlands during the period 1981–85 (based on a different data set). However, they did not allow the efficiency parameter (k) to vary over time and across regions.

The parameter for LONG has an unexpected positive sign, but is far from significant in both models. A negative, but also insignificant, effect of occupational mismatch is observed in model II. We conclude that the proxies for the heterogeneity of the regional stocks of unemployment and vacancies play no important role in the matching function.

The regional differences in labor market efficiency can easily be computed from the parameters in Table 2 (for example, $k_{gr}/k_{li} = \exp(0.18) = 1.2$). In Table 3, regional efficiency levels and their 95% confidence intervals are presented relative to the province of Limburg (for which efficiency is normalized and set to one).

Table 3 shows that the Northern provinces Friesland and Drenthe and the Southern provinces Zeeland and Noord-Brabant have the highest levels of labor market efficiency, while the Southern province Limburg and the core regions Zuid-Holland and Gelderland have the lowest efficiency levels. Furthermore, we note that the confidence intervals are overlapping for all regions, with the exception of Limburg. The favorable outcomes for the Northern provinces are also found in previous studies of regional differences in labor market efficiency (see Gorter 1991; van Ours 1992) that were based on different empirical models and other data sources (i.e., regional unemployment and vacancy duration). According to our model, relatively high efficiency levels in a region must be due to a less restrictive acceptance behavior of job seekers and employers, or to a higher "clock speed" of the regional matching process (i.e., job seekers and employers find each other in a relatively short period of time).

In order to shed light on the importance of the regional differences in labor market efficiency, we tested both models for homogeneity of labor market efficiency across regions. For model I, the restriction of equal regional dummy variables is not rejected (F-statistic equal to 1.80, with a critical value at 5% equal to 2.05), but for model II the restricted specification of the matching model is rejected (F-statistic equal to 4.09, which exceeds the critical value of 1.97). Consequently, it depends on the model used (i.e., on the time period) whether or not the regional dummies as a group are significant. Hence, this issue should be further analyzed empirically before clear conclusions can be drawn. In the current paper, we found no strong evidence that regional differences in labor market efficiency are important. This suggests that the regional differences in unemployment are to a large extent correlated with regional differences in labor demand. A similar conclusion is made by Gorter (1991) who examined the determinants of the dynamic components (duration and inflow) of regional unemployment in the Netherlands.

5. CONCLUSIONS

In this paper we focused on the functioning of regional labor markets in the Netherlands during the 1980s by examining differences in labor market efficiency. To this end, we could not apply a traditional U-V approach, because the flow of filled vacancies is not constant over the estimation period. Consequently, we based our conclusions on the results of a dynamic matching approach, which regards unemployment and vacancies to be determinants of the number of matches.

The estimation results show that the matching process can be described by a "search production" function with constant returns to scale. We also find that efficiency increased substantially during the economic recession that took place in the beginning of the 1980s. A possible explanation for this phenomenon might be that the scarcely available vacancies induced unemployed workers to increase their search intensity, and to accept job offers more fre-

quently than before. The statistical evidence with respect to the importance of regional differences in labor market efficiency is mixed. The labor markets in the peripheral regions Friesland and Drenthe perform somewhat better than the core regions, implying that the labor market functioning of the latter regions can be improved by increasing acceptance probabilities of job seekers and employers, or by reducing the time period needed for them to find each other. On the other hand, efficiency differences appear to be modest for most regions, suggesting that unfavorable regional labor market condition are caused by a lack of regional demand. This implies that for most regions, regional labor market policies should attempt to stimulate labor demand in order to reduce unemployment. How this increase in demand should be accomplished is a different matter.

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REFERENCES

Belderbos, R., and Teulings, C. 1988. A new empirical specification of the U-V relation with an application to the Netherlands. Working paper, Stichting Economisch Onderzoek, Amsterdam.

Blanchard, O. J., and Diamond, P. 1989. The Beveridge curve. *Brookings Papers on Economic Activity* 1: 1–76.

Blanchard, O. J., and Diamond, P. 1992. The flow approach to labor markets. *American Economic Review, Papers and Proceedings* 82: 354–59.

Borsch-Supan, A. H. 1991. Panel data analysis of the Beveridge Curve: Is there a macroeconomic relation between the rate of unemployment and the vacancy rate? *Economica* 58: 279–97.

Evers, G. H. M. 1989. Simultaneous models for migration and commuting: Macro and micro economic approaches. In *Migration and labor market adjustment*, eds. J. van Dijk, H. Folmer, H. W. Herzog Jr. and A. M. Scholttmann, pp. 177–97. Dordrecht: Kluwer Academic Publishers.

Fischer, M. M., and Nijkamp, P. 1987. *Regional labor markets*. Amsterdam: North-Holland.

Gorter, C. 1991. *The dynamics of unemployment and vacancies on regional labor markets*. Amsterdam: Thesis Publishers.

Gorter, C., and van Ours, J. C. 1992. Matching unemployment and vacancies in regional labor markets; an empirical analysis for the Netherlands. *Research Memorandum 92–44*, Free University, Amsterdam.

Jackman, R., Layard, R., and Pissarides, C. 1989. On vacancies. *Oxford Bulletin of Economics and Statistics* 51: 377–94.

Layard, R., Nickell, S., and Jackman, R. 1991. *Unemployment*. Oxford: Oxford University Press.

Pissarides, C. 1990. *Equilibrium unemployment theory.* Cambridge: Basil Blackwell.

van Ours, J. C. 1991. The efficiency of the Dutch labor market in matching unemployment and vacancies. *De Economist* 139: 358–78.

van Ours, J. C. 1992. Regional differences in the efficiency of the Dutch labor market. In *On the Mysteries of Unemployment*, eds. C. H. A. Verhaar and L. G. Jansma, pp. 179–88. Dordrecht:: Kluwer Academic Publishers.